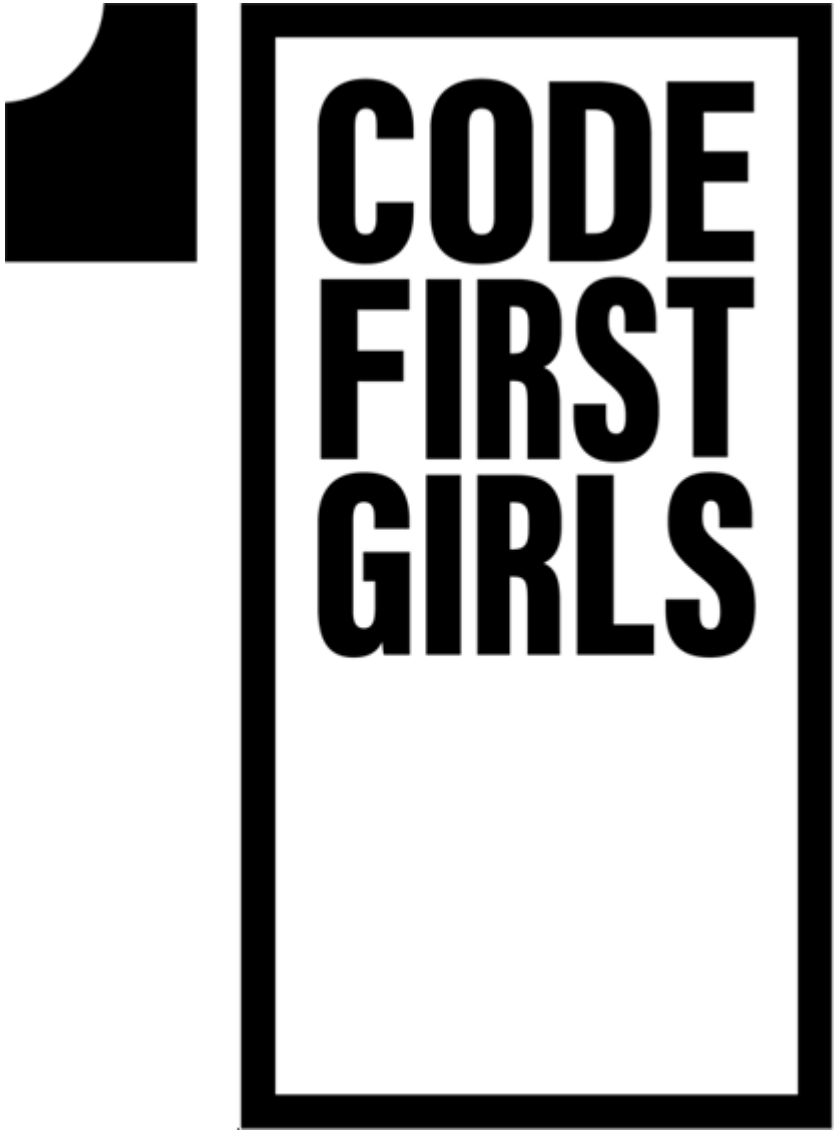
Starter: There are four mistakes in this program. What are the mistakes and how would you fix them?

```
carrots = input('How many carrots do you have? ')
rabbits = 6

if rabbits < carrots:
    print('There are not enough carrots')
if rabbits > carrots:
    print('There are too many carrots')
else:
    print('You have the right number of carrots')
```



Python Session 4

This session:

1. Lists
2. Dictionaries

Lists

List: an ordered collection of values

List are written inside square brackets and separated by commas

A list of integers

```
lottery_numbers = [4, 8, 15, 16, 23, 42]
```

A list of strings

```
student_names = ['Diedre', 'Hank', 'Helena', 'Salome']
```

Lists can be made up of values of one or more data types

```
person = ['Jess', 32]
```

List values can be accessed using their **index** in square brackets

```
student_names = ['Diedre', 'Hank', 'Helena', 'Salome']

print(student_names[2])
```

```
Helena
```

List indexes start counting from 0

```
student_names = [
    'Diedre',    # index 0
    'Hank',      # index 1
    'Helena',    # index 2
    'Salome'     # index 3
]

print(student_names[0])
```

```
Diedre
```

You can also set the values in lists using their indexes, similar to how you would set a variable

```
student_names = [
    'Diedre',    # index 0
    'Hank',      # index 1
    'Helena',    # index 2
    'Salome'     # index 3
]

student_names[1] = 'Joshua'
print(student_names)
```

```
['Diedre', 'Joshua', 'Helena', 'Salome']
```

Exercise 4.1: When I'm travelling in the winter I often forget to pack warm clothes. Let's write a program to help me to remember the right clothes.

The program should check if the first item in the `clothes` list is `"shorts"`. If it is it should change the value to `"warm coat"`.

```
clothes = [
    "shorts",
    "shoes",
    "t-shirt",
]
```

Solution

```
clothes = [
    "shorts",
    "shoes",
    "t-shirt",
]

if clothes[0] == 'shorts':
    clothes[0] = 'warm coat'

print(clothes)
```

```
['warm coat', 'shoes', 't-shirt']
```

List Functions

There are functions designed for lists

- `len()`: the number of items in a list
- `max()`: The biggest value in a list
- `min()`: The smallest value in a list

```
costs = [1.2, 4.3, 2.0, 0.5]

print(len(costs))
print(max(costs))
print(min(costs))
```

```
4
4.3
0.5
```

Functions for changing the order of a list

- `sorted()`: Sorts the
- `reversed()`: Reverses the order of a list

```
costs = [1.2, 4.3, 2.0, 0.5]

print(sorted(costs))
print(list(reversed(costs)))
```

```
[0.5, 1.2, 2.0, 4.3]
[0.5, 2.0, 4.3, 1.2]
```

Exercise 4.2: Make a list of game scores. Using list functions write code to output information of the scores in the following format:

```
Number of scores: 10
Highest score: 200
Lowest score: 3
```

Extension: Output all of the scores in descending order

append() and in

You can check if an value is in a list using the `in` operator. If the value is in the list it will result in `True` and `False` if it is not.

```
student_name = input('Which student are you looking for? ')

students = [
    'Diedre', 'Hank', 'Helena', 'Salome',
]

if student_name in students:
    print('{} is in the class'.format(student_name))
else:
    print('{} is not in the class'.format(student_name))
```

```
Which student are you looking for? Hank
Hank is in the class
```

The `.append()` method is used to add items to a list

```
students = [
    'Diedre', 'Hank', 'Helena', 'Salome',
]
student_name = input('What is the name of the new student? ')

students.append(student_name)

print(students)
```

```
What is the name of the new student? Jo
['Diedre', 'Hank', 'Helena', 'Salome', 'Jo']
```

Exercise 4.3: Whenever I'm shopping and I buy some bread I always forget to buy butter. Create a list and if `'bread'` is in the list, add `'butter'` to the shopping list.

Try running the program with and without bread in the list to check that your program works.

Remember the `in` operator checks if an item is in a list and the `.append()` method adds an item to a list.

Solution

```
shopping_list = [
    'bread',
    'cheese',
    'pop tarts',
    'carrots',
]

if 'bread' in shopping_list:
    shopping_list.append('butter')
```

To check if an item is not in a list

```
fridge = [
    'cheese',
    'pizza',
    'coke',
]

if 'milk' not in fridge:
    print('You have no milk in the fridge')
```

```
You have no milk in the fridge
```

For Loops ♥ Lists

Using lists and for loops together

```
student_names = ['Diedre', 'Hank', 'Helena', 'Salome']

for student_name in student_names:
    print(student_name)
```

```
Diedre
Hank
Helena
Salome
```

Counting the total number of items in a list using a for loop

```
student_names = ['Diedre', 'Hank', 'Helena', 'Salome']
count = 0

for student_name in student_names:
    count = count + 1

print(count)
```

4

Exercise 4.4: I want to work out how much money I've spent on lunch this week. I've created a list of what I spent each day.

Write a program that uses a `for` loop to calculate the total cost

```
costs = [8.30, 7.12, 5.01, 1.00, 0.99, 5.92, 3.50]
total_cost = 0
```

Solution

```
costs = [8.30, 7.12, 5.01, 1.00, 0.99, 5.92, 3.50]
total_cost = 0

for cost in costs:
    total_cost = total_cost + cost

print(total_cost)
```

```
31.839999999999996
```

There is an easier way to do the last program without a for loop. The `sum()` function can be used to add up all of the values in a list:

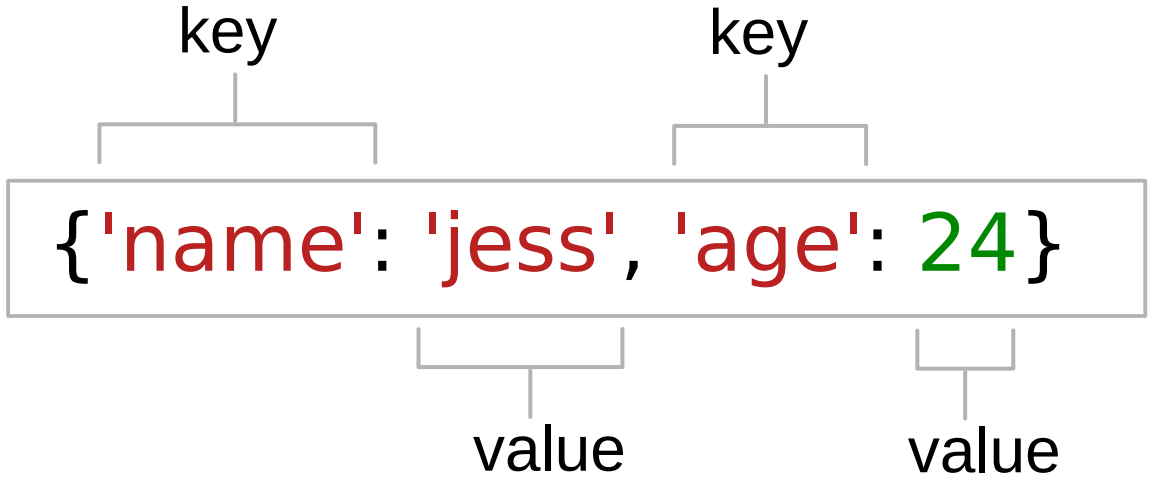
```
costs = [8.30, 7.12, 5.01, 1.00, 0.99, 5.92, 3.50]
total = sum(costs)

print(total)
```

```
31.839999999999996
```

Dictionaries

Dictionary: Stores a colleciton of labelled items. Each item has a *key* and a *value*

```
person = {
    'name': 'Jessica',
    'age': 23,
    'height': 172
}
```


key
key
{'name': 'jess', 'age': 24}
value
value

Values in a dictionary are accessed using their keys

```
person = {
    'name': 'Jessica',
    'age': 23,
    'height': 172
}

print(person['name'])
```

```
Jessica
```

Exercise 4.5: Print the values of `name`, `post_code` and `street_number` from the dictionary

```
place = {
    'name': 'The Anchor',
    'post_code': 'E14 6HY',
    'street_number': '54',
    'location': {
        'longitude': 127,
        'latitude': 63,
    }
}
```

Extension: Print the values of `longitude` and `latitude` from the inner dictionary

Solution

```
place = {
    'name': 'The Anchor',
    'post_code': 'E14 6HY',
    'street_number': '54',
    'location': {
        'longitude': 127,
        'latitude': 63,
    }
}

print(place['name'])
print(place['post_code'])
print(place['street_number'])
```

```
The Anchor
E14 6HY
54
```

Extension:

```
print(place['location']['longitude'])
print(place['location']['latitude'])


location = place['location']

print(location['longitude'])
print(location['latitude'])
```

```
127
63
127
63
```

Dictionaries in Lists

Putting dictionaries inside a list is very common

```
people = [
    {'name': 'Jessica', 'age': 23},
    {'name': 'Trisha', 'age': 24},
]

for person in people:
    print(person['name'])
    print(person['age'])
```

```
Jessica
23
Trisha
24
```

Exercise 4.6: Using a for loop, output the values `name`, `colour` and `price` of each dictionary in the list

```
fruits = [
    {'name': 'apple', 'colour': 'red', 'price': 0.12},
    {'name': 'banana', 'colour': 'yellow', 'price': 0.2},
    {'name': 'pear', 'colour': 'green', 'price': 0.19},
]
```

Solution

```
fruits = [
    {'name': 'apple', 'colour': 'red', 'price': 0.12},
    {'name': 'banana', 'colour': 'yellow', 'price': 0.2},
    {'name': 'pear', 'colour': 'green', 'price': 0.19},
]

for fruit in fruits:
    print(fruit['name'])
    print(fruit['colour'])
    print(fruit['price'])
```

```
apple
red
0.12
banana
yellow
0.2
pear
green
0.19
```

Random Choice

The `choice()` function in the random module returns a random item from a list

```
import random

colours = ['red', 'green', 'blue']
chosen_colour = random.choice(colours)

print(chosen_colour)
```

```
green
```

Exercise 4.7: Write a program to create a random name. You should have a list of random firstnames and a list of lastnames. Choose a random item from each and display the result.

Extension: Using list of verbs and a list of nouns, create randomised sentences

Recap

This session:

1. Lists
2. Dictionaries

Question 1: What shape brackets are used for creating a list and what shape brackets are used for creating a dictionary?

Question 2: What is the result of this program?

```
cheeses = [
    'brie',
    'cheddar',
    'wensleydale',
    'edam',
]

print(cheeses[4])
```

Question 3: This program raises an error when I run it. What do I need to change to get it to run?

```
trees = [
    {'leaf_colour': 'green', 'height': 2120},
    {'leaf_colour': 'green', 'height': 2300},


new_tree = {
    'leaf_colour': 'green',
    'height': 1020
}

trees.append(new_tree)

print(trees)
```

Homework: Session 4 homework questions in your student guide